HELMINTHS FROM SOME LIZARDS MOSTLY FROM SOUTH AUSTRALIA

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SUMMARY

An account is given of helminths from lizards from an area near Port Gawler in South Australia, including a table of their incidence. Records are also given of trematodes from two Queensland lizards. Species recorded (all from the Pt. Gawler region unless otherwise stated) are: *Paradistomum crucifer* (Nicoll) (syns. *Eurytrema crucifer* Nicoll, *Paragonimus trachysauri* MacCallum, *Cephalogonimus trachysauri* MacCallum, *Paradistomum maccallumi* Johnston) from *Hemiergis peronii*, *Trachydosaurus rugosus* (Pt. Gawler area and from Murray Bridge, S.A.), *Tiliqua scincoides* (Queensland), and *Varanus varius* (Queensland); *Oochoristica trachysauri* (MacCallum) (syn. *Oochoristica australiensis* Spassky (from *Trachydosaurus rugosus*; *Thelandros kartana* Johnston and Mawson from *H. peronii*, *Phyllodactylus marmoratus*; *T. trachysauri* Johnston and Mawson from *Trachydosaurus rugosus*; *Skrjabinodon smythi* n. sp. from *P. marmoratus*. Other helminths recorded are *Microphallus* sp. from *T. rugosus*; *Trematoda*, ? sp., from *Rhodona bougainvillii*; *Oochoristica* sp. and *Baerietta* sp. from *R. bougainvillii*, *H. peronii* and *P. marmoratus*; *Skrjabinelazia* sp. from *P. marmoratus*; acanthocephalan cysts from *H. peronii*.

INTRODUCTION

During 1967, Dr. Michael Smyth, of this department, undertook an investigation of aspects of the ecology of lizards inhabiting a coastal strip north of Adelaide. The parasites of these lizards, and some from the same host species from different localities, are discussed in this paper. The occurrence of a trematode from two other species of lizards, both from Queensland, is also recorded.

We are very grateful to Dr. Smyth, not only for giving us the viscera for examination, but also for the regularity and precision of his collection and records. An account of his work is in press.

The study area is a short distance north of Adelaide and the two collecting centres are Port Gawler and Middle Beach. The two areas are separated by two permanent salt water channels. The lizards from each area are listed in Table 1, with records of parasitism. It will be noted that trematodes were found (except in one case) only at Middle Beach; cestodes and nematodes occurred in both areas. Juvenile lizards seem to be free from helminths. Records were kept of the sex of each lizard dissected, but this appeared to have no significance in relation to the infestation by helminths, and has not been indicated in the Table.

Differences in the incidence of parasitism, as well as of the different groups of helminths, in the different species of lizards, are quite marked, and are discussed below.

We are grateful to Dr. S. J. Edmonds, of this department, for examining the acanthocephalan cysts. Our thanks are also due to Mr. John Mitchell, of the South Australian Museum, for the correct names of the lizards concerned.

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TABLE 1

Incidence of helminths in the study area.

The figures refer to the number of lizards dissected or found parasitised. An asterisk indicates that the alimentary canal only, not the gall bladder, of these specimens was examined

Lizard	Locality	Number dissected	Number parasitised	Number yielding			
				Trematoda	Cestoda	Nematoda	Acanthocephala
Trachydosaurus rugosus (Gray)	Pt. Gawler	3	3	—	—	3	—
	Middle Beach	6	6	1	2	5	—
Ablepharus greyii (Gray)	Pt. Gawler	8*	0				
		1	0				
	Middle Beach	2	0				
Hemiergis peronii (Fitzinger)	Pt. Gawler	80*	16	—	7	12	
		99	26	—	7	20	2
		10 juv.	0				
	Middle Beach	13*	4	—	—	4	—
		71	37	15	2	34	3
		9 juv.	0				
H. decresiensis (Fitzinger)	Pt. Gawler	1	0				
Rhodona bougainvillii (Gray)	Pt. Gawler	20	14	1	11	—	
Phyllodactylus marmoratus (Gray)	Pt. Gawler	12	11	—	2	10	—
		1 juv.	0				
	Middle Beach	1	1	—	—	1	—

PARASITES RECORDED, ARRANGED UNDER THEIR HOSTS

Trachydosaurus rugosus Gray. *Microphallus* sp.; *Paradistomum crucifer* (Nicoll); *Thelandros trachysauri* Johnston and Mawson.

Hemiergis peronii (Fitzinger). *Paradistomum crucifer* (Nicoll); *Oochoristica* sp.; *Baerietta* sp.; *Pharyngodon kartana* Johnston and Mawson.

Tiliqua scincoides (Shaw). *Paradistomum crucifer* (Nicoll).

Rhodona bougainvillii (Gray). *Trematoda*, ? sp.; *Oochoristica* sp.; *Baerietta* sp.

Phyllodactylus marmoratus (Gray). *Skrjabinodon smythi* n. sp., *Thelandros kartana* Johnston and Mawson; *Skrjabinelazia* sp.

Varanus varius (Shaw). *Paradistomum crucifer* (Nicoll).

TREMATODA

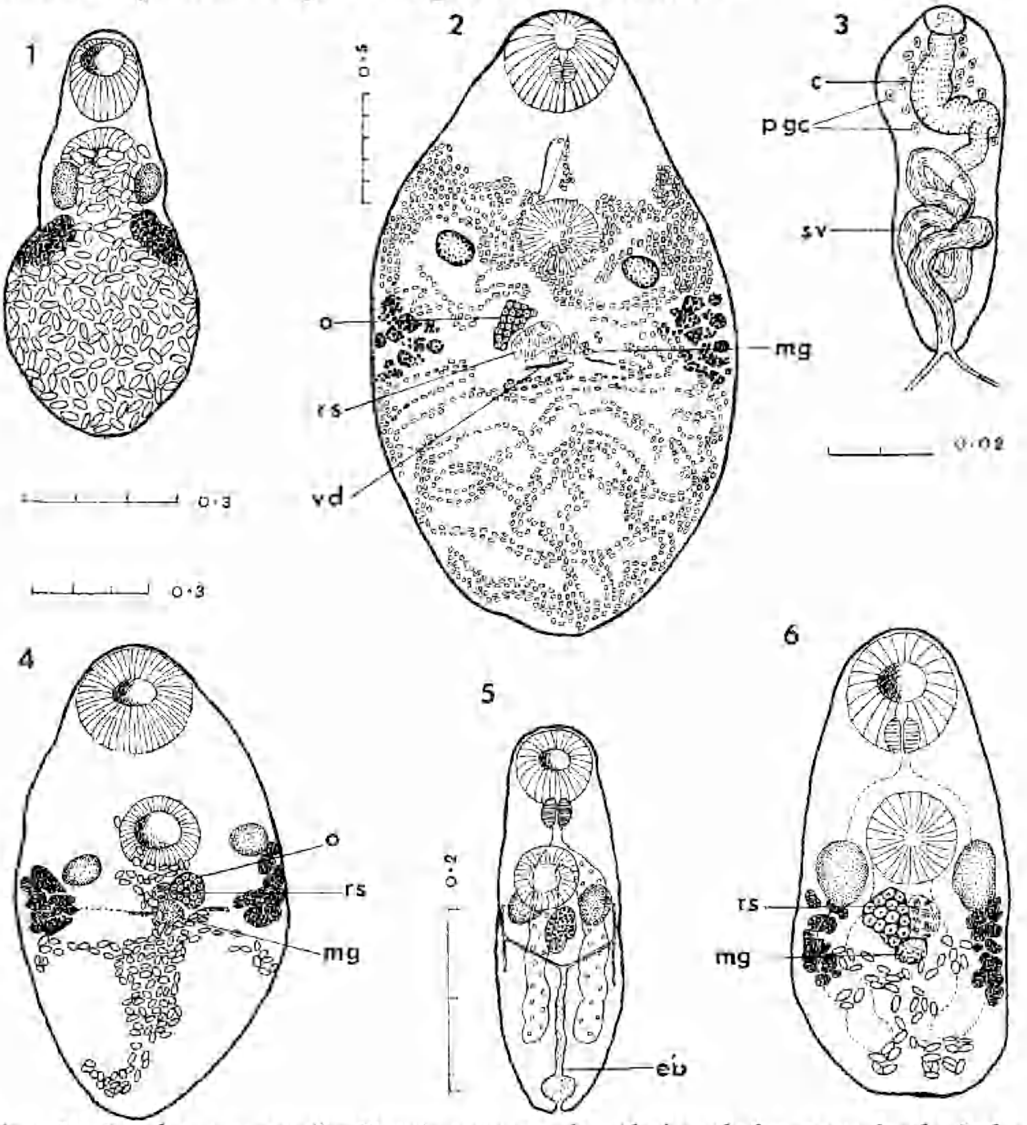
Paradistomum crucifer (Nicoll)

(Figs. 1-6)

Eurytrema crucifer Nicoll, 1914, 538, in gall-bladder, *Delma fraseri*.
Paradistomum crucifer (Nicoll) Travassos, 1919, 12; 1944, 256.
Paragonimus trachysauri MacCallum, 1921, 173, in gall-bladder, *Trachydosaurus rugosus* (syn. *Trachysaurus rugosus*).
Cephalogonimus trachysauri MacCallum, 1921, 176, in gall-bladder, *Trachydosaurus rugosus*.
Paradistoma trachysauri (MacCallum) Dollfus, 1922, 329.
Paradistoma trachysauri (MacCallum) Dollfus; Johnston, 1932, 64.
Paradistomum maccullumi Johnston, 1932, 64 (nom. nov. for *Cephalogonimus trachysauri* (MacCallum).
Paradistomum trachysauri (MacCallum) Dollfus; (syns. *Paragonimus trachysauri* MacCallum and *Paradistomum maccullumi* Johnston). Malau 1939, 37.
Paradistomum trachysauri (MacCallum) Dollfus; Travassos, 1944, 262.

Hosts and Localities: *Hemiergis peronii*, Middle Beach, South Australia, from gall-bladder, occasionally in small intestine; *Trachydosaurus rugosus*, Murray Bridge district, South Australia, from gall-bladder and liver; *Tiliqua scincoides*, Facing Island, near Gladstone, Queensland, apparently collected by Professor T. Harvey Johnston, in 1918, from gall-bladder (ten specimens from one host); *Varanus varius*, Townsville, Queensland, collected by Dr. G. A. M. Heydon in 1927, from gall-bladder (two specimens from one host).

The description is based on 24 stained and mounted specimens from *Hemiergis peronii*, with details from living specimens. Notes on the trematode from *Trachydosaurus rugosus* are given in the discussion.



Figs. 1-6 *Paradistomum crucifer*. Drawings were made with the aid of a camera lucida. Scales in millimetres. Figs. 1 and 6 to same scale. Eggs not drawn exactly to scale.

Figs. 1-3, 5, 6, from *Hemiergis peronii*; 1, 2, 6, adults, showing variation in form, and in extent of uterus, (2, flattened); 3, cirrus sac, from specimen shown in fig. 2, enlarged; 5, young adult, excretory system from living specimen. Fig. 4, type specimen redrawn (from *Delma fraseri*). c, cirrus; eb, excretory bladder; mg, Mehlis' gland; o, ovary; pgc, prostate gland cells; rs, receptaculum seminis; sv, seminal vesicle; vd, vitelline duct.

The numbers of trematodes in the infected *H. peronii* ranged from 1-15, and generally included juveniles as well as adults. One gall-bladder contained 65 specimens, but all were very young. Nearly all specimens were found in the gall-bladder, but a few were in the liver, and four were taken from the intestine. Of these last, three were in two hosts whose gall-bladders were uninfected, and the fourth was in a lizard whose gall-bladder contained twelve trematodes. In one lizard only, the trematodes were found not only in the gall-bladder (thirteen), but also in ducts which appear to be pancreatic, running through the elongated pancreas from the gall-bladder to the intestine (fifteen).

Specimens were fixed, under a coverslip with only slight pressure, in formol acetic alcohol, stained in Van Cleave's combination haematoxylin stain, and mounted in Depex.

DESCRIPTION

Shape: Elongated or leaf-like when living; fixed specimens with bluntly rounded posterior and often somewhat elongated anterior end. Colour pale pink, with caeca yellow.

Body 0·748-2·890 mm long by 0·306-1·496 mm wide. Cuticle not spined. Oral sucker rounded or slightly oval, 223-494 μ (average 342 μ) long by 129-423 μ (330 μ) wide. Acetabulum rather inconspicuous, rounded, 170-353 μ (235 μ) long by 141-306 μ (239 μ) wide; anterior border near anterior third of body. Ratio of width of oral to width of ventral sucker 1:0·7 to 1:0·9. Prepharynx short; pharynx 50 by 50 μ—110 by 100 μ, dorsal to oral sucker or partly posterior to it; oesophagus short; caeca wide, sinuous, extending nearly to posterior end of body.

Testes symmetrical, at sides of acetabulum, rounded in living, may be irregular in fixed specimens, equal or sub-equal, 71-165 μ (110 μ) long by 59-176 μ (106 μ) wide. Cirrus sac 92-184 μ long by 45-100 μ wide, between suckers, at an angle to left of mid-line. Seminal vesicle internal, much coiled. Cirrus inconspicuous, slightly coiled, surrounded by diffuse prostatic cells. Genital pore median, near posterior border of oral sucker.

Ovary post-acetabular, sinistral, irregular, 82-223 μ long by 71-188 μ wide. Receptaculum seminis mostly dorsal to ovary, may be posterior or to either side of it, 47-141 μ (96 μ) by 59-212 μ (107 μ). Mehlis' gland irregular, generally posterior to ovary and slightly to right. Laurer's canal not seen. Uterus varying in extent from condition shown by Nicoll, with relatively few eggs (Fig. 6), to one in which it fills all of hind-body and an area in front of acetabulum; passing to right of cirrus sac and opening by muscular metraterm at genital pore.

Eggs variable, largest 40 μ by 22 μ.

Vitellaria extracaecal, restricted to middle of body, reaching level of posterior third of acetabulum anteriorly; 270-764 μ (476 μ) in extent; lobules variable, some moderately large. Transverse yolk ducts widening at junction in mid-line, but forming no obvious yolk reservoir.

Excretory bladder elongate, main arms leaving anterior end. Excretory pore terminal.

DISCUSSION

The mature trematodes found in *Hemiergis peronii* in this study show a considerable variation in size, ranging from 0·748 by 0·374 mm to 2·890 by 1·258 mm, and in appearance. The trematodes found in the pancreatic ducts were greatly elongated, while the worms from the gall-bladder tended to be

foliate. As immature specimens are often present with the adults, some of the differences among egg-bearing adults are probably due to differences in age. For example, the testes and ovary may be as large in small worms as in much larger ones (Figs. 2, 6) giving a disproportionate emphasis to these organs in the small specimens. The specimen shown in Fig. 1 shows the acetabulum very near the oral sucker; a specimen of similar size from the same host showed a similar arrangement of eggs, but the body was more elongated and the acetabulum was in the more typical position. Even among specimens of the same size there is great variation in the number of eggs, and this leads to differences of form and general appearance. In the original description of *Paradistomum crucifer*, Nicoll stated that the uterus, especially in the less mature specimens, had a characteristic cruciform course, but that in more mature specimens this arrangement was, to some extent, obliterated. Among the small trematodes of my collection, some (Fig. 6) have a uterus showing the cruciform course, while in others (Fig. 1) the eggs form a more or less solid mass in the hind-body and sometimes anteriorly to the acetabulum, so that most of the organs are obscured. Even among the larger specimens there is also a good deal of variation in the number of eggs.

By courtesy of the Director of the School of Public Health and Tropical Medicine, Sydney, one of us (L.M.A.) has been able to examine the type of *P. crucifer*. Some of our smaller specimens are very similar to it in appearance, and one of them is almost identical with it, not only in overall size, but in the size and arrangement of the organs. The trematodes from *Hemiergis peronii* must be regarded as *Paradistomum crucifer*.

Although the range of measurements given by Nicoll shows that his specimens were uniformly smaller than the trematodes found in *H. peronii*, Nicoll's description was based only on "a few" worms. In addition, all measurements given by Nicoll are consistently smaller than those now made on the type (Table 2). It is possible that this is due to some flattening of the specimen over the years; it is also possible that Nicoll had made a mistake in his scale.

MacCallum (1921) found about twenty trematodes in the gall-bladder of a stump-tailed lizard, *Trachydosaurus rugosus*, which died in the New York Zoo. He stated: "there were three different sizes among them, which, with the decided differences in form, would almost make it necessary to divide them into three species, but as they are in many particulars alike, and for brevity's sake, we shall describe them as one species". This he named *Paragonimus trachysauri*. Later in the same paper MacCallum stated that he had found two different trematodes in the lizard, one being *P. trachysauri;* the second he described as *Cephalogonimus trachysauri*. Malan (1939) regarded the two as identical, and thus synonymous with *Paradistomum trachysauri*, and this has been accepted by later workers.

Although the largest specimens from *H. peronii* are smaller than the measurements given by MacCallum for *Paradistomum trachysauri*, the measurements of ovaries and testes are comparable, the ratios of the suckers appear similar, and the specimens resemble the one figured by MacCallum. Differences in fixation could account for some differences in body dimensions, as also could the relative sizes of the hosts*. There seems no reason to regard the specimens from *Hemiergis peronii* as distinct from those described by MacCallum from *Trachydosaurus rugosus*, so that *Paradistomum trachysauri* must become synonymous with *P. crucifer*. It should be noted, however, that *P. crucifer* as now interpreted

* It is of interest to note that *Delma fraseri* (the type host of *Paradistomum crucifer*), a pygopodid lizard, and *Hemiergis peronii* are much smaller than *Trachydosaurus rugosus*. I have not dissected *D. fraseri*, but it can be expected that its gall-bladder is very little larger than that of *H. peronii*, which is much smaller than that of *T. rugosus*.

TABLE 2

Paradistomum crucifer (Nicoll)

Described as	*Eurytrema crucifer* (type specimen)		*Paragonimus trachysauri*	*Cephalogonimus trachysauri*	*Paradistomum crucifer*	*Paradistomum crucifer*	*Paradistomum crucifer*	*Paradistomum crucifer*
Host	*Delma fraseri*		*Trachydosaurus rugosus*	*Trachydosaurus rugosus*	*Hemiergis peronii*	*Trachydosaurus rugosus*	*Varanus varius*	*Tiliqua scincoides*
Locality	North Queensland		New York Zoo	New York Zoo	Middle Beach	nr. Murray Bridge, S.A.	Townsville, N. Q'ld.	nr. Gladstone, Q'ld.
Date collected	—	—	30/8/18	30/8/18	1967	2/1968	1927	1918
Measurements given by	Nicoll, 1914	Present study	MacCallum, 1921	MacCallum, 1921	Present study	Present study	Present study	Present study
Number examined	"a few"	1	? 17	3	24	2[5]	2	4
Length	0·7–0·8	1·224	5·00	3·00	0·748–2·890	1·088–3·774[6]	2·720–3·162[7]	2·142–2·516[7]
Width	0·35–0·4	0·714	2·00	0·70	0·306–1·496	0·289–0·918	0·884–0·918	1·088–1·292
Oral sucker[1]	0·18	0·294	—	0·320	0·129–0·423[4]	0·137–0·388	0·341–0·412	0·376–0·423
Acetabulum[1]	0·15	0·223	—	0·328	0·141–0·306[4]	0·118–0·306	0·341–0·365	0·270–0·329
Sucker ratio	1:0·83	1:0·76	[3]	1:1	1:0·7–1:0·9	1:0·86;1:0·8	1:0·88;1:1	1:0·78 (av.)
Pharynx	0·04	—	—	—	0·051–0·100	0·053–0·107	0·141	—
Testes—length	0·04	0·071–0·106	0·15	0·200	0·071–0·165	–0·147	—	—
—width	—	0·082–0·094	—	—	0·059–0·176	–0·184	—	—
Ovary—length	"About same	0·094	0·2	0·280	0·082–0·223	–0·123	—	—
—width	size as testes"	0·082	—	—	0·071–0·188	· 0·263	—	—
Eggs	30-33 x 21	36 x 22[2]	50 x 20	40 x 20	40 x 22[2]	39 x 24[2]	31 x 20[2]	35 x 20[2]

All measurements are in millimetres, except for eggs, which are in microns.

[1] In measurements made in the present study, the width of suckers is given.

[2] Largest egg measured.

[3] Although MacCallum states in the text that "the acetabulum is as large as the mouth", his figure shows the acetabulum as smaller.

[4] The apparent discrepancy in the lower part of the two ranges is accounted for by the fact that, in the specimen with smallest suckers, the oral sucker was longer than broad, while the acetabulum was broader than long.

[5] The largest and smallest of 30 specimens.

[6] Specimens less flattened than those from *Hemiergis peronii* (see discussion).

[7] Spirit specimens; do not appear to have been flattened in any way.

shows considerable variation in size and general appearance. Variation has already been reported for another species of *Paradistomum* by Dollfus (1922, 328, footnote), who referred to the great morphological variations he had found in *P. mutabile* (Molin).

This is the first Australian record of a trematode from a lizard since MacCallum's report of *P. trachysauri*. In 1932, Harvey Johnston reported that "a number" of *T. rugosus* had been searched for parasites from time to time, but that no trematodes had been found. After *P. crucifer* was found in *H. peronii* in the present study, as many *T. rugosus* as possible were examined. It was not until this paper was completed that *P. crucifer* was found in this host, in two lizards from the Murray Bridge district. (Of the forty-five *T. rugosus* dissected only nine were from the study area north of Adelaide. The remainder came from a number of different localities.) In the first lizard there were 34 trematodes in the gall-bladder and 12 in the liver. In the second, there were 56 living and a number of disintegrating worms (which were mere collections of eggs) in the gall-bladder, and 13 living worms in the liver. The lizards had been in captivity for almost two months when they were dissected. All the trematodes were mature, but great differences in size were found. The specimens were fixed in formol acetic alcohol under a coverslip. Virtually no pressure was required to fix them flat, so that the measurements are not truly comparable with those of the specimens from *H. peronii* (which were fixed with slight pressure) but would probably have been greater (certainly in the width of the body) had the worms been fixed with the same pressure. Measurements of the largest and the smallest specimens from the first infected lizard are given in Table 2.

The following observations were made on the living trematodes from *T. rugosus*. The caeca appear bright yellow (due to bile), and contain many crystals, as recorded by MacCallum. These are tetragonal in shape, and vary in size from fine slender crystals to forms up to 223 μ by 35 μ by 35 μ. (Crystals were not present in *P. crucifer* from *H. peronii;* this is presumably due to a difference in composition of the bile of the two lizards.) The part of the body which is not coloured by bile or obscured by eggs is pale pink in colour. Twenty mature eggs taken at random from the liver washings measured 34-39 μ (37 μ) by 21-24 μ (22 μ).

P. crucifer from both hosts was very sensitive to changes in the medium in which it was kept. In 0·65% saline it very quickly became swollen and died. It could be kept alive in bile at 6°C for several days.

LIFE HISTORY

The only species of *Paradistomum* for which investigations on the life-history have been recorded is *P. mutabile* (Molin). Timon-David and Timon-David (1967) infected *Helicella arenosa* experimentally and obtained brevicercous xiphidiocercariae. (*H. arenosa* was not the normal host since it did not occur on the islands on which *Paradistomum mutabile* was commonly found in lizards). The cyst stage was not found, but the authors thought it probable that a second intermediate host is necessary, and suggested an isopod or an insect.

In the present study no information could be gathered on the life-history of *P. crucifer*. The only land snails found in the study area are *Austrosuccinea australis* Ferrusac, *Omegapilla australis* Angas, *Australbinula margaretae* Cox and *Paralaoma stabilis* Iredale. The last three of these are very small snails and quite difficult to find in the litter in which they occur. (*P. stabilis* was not, in fact, found

in the open at all, but was recovered from the stomachs of lizards, in which it occurred quite often). It was therefore not possible to conduct any trematode life-history studies with these molluscs. Attempts were made to infect *Austrosuccinea australis* (collected from another area) but it proved impossible to keep the snails alive long enough to obtain any results.

It will be seen from Table 1 that whereas fifteen of seventy-one *Hemiergis peronii* from Middle Beach were infected with *Paradistomum crucifer*, none of ninety-nine of these lizards from Port Gawler harboured the parasite. We can suggest no reason for this.

If, as seems likely, a second intermediate host is necessary, it is to be sought among the animals listed by Smyth (1968) as found in the stomachs of *H. peronii*. Of these, the most common are weevils, free-living mites (very small species), ants, cockroaches, moths and snails.

Microphallus sp.

Host and Locality. Trachydosaurus rugosus, Middle Beach.
One specimen, in upper small intestine.

Trematoda, ? sp.

Host and Locality. Rhodona bougainvillii, Port Gawler.
One specimen, in intestine.

CESTODA

The authors, neither of whom is a cestodologist, are greatly indebted to Dr. John Hickman, of the Zoology Department, University of Tasmania, for identification of *Baerietta* sp. and verification of *Oochoristica* spp. Further identification of the material will be made by Dr. Hickman.

Oochoristica trachysauri (MacCallum)
(Fig. 7)

Taenia trachysauri MacCallum, 1921, 229.
Oochoristica trachysauri (MacCallum), Johnston, 1932, 65.
Oochoristica australiensis Spassky, 1951, 547.

Host and Locality. Trachydosaurus rugosus, Middle Beach, South Australia.

This species was fully described by Johnston (1932). Spassky (1951) considered Johnston's specimens different from those of MacCallum and proposed for them a new species, *O. australiensis*. The material now examined, all from one host, shows similarity to all earlier collections—some specimens with an obvious rostellum, some with rounded anterior end; the mature segments vary (sometimes abruptly, fig. 7) from more or less square to elongate. It is considered that all belong to the same species.

Oochoristica sp.

Hosts and Locality. Rhodona bougainvillii, Hemiergis peronii, Phyllodactylus marmoratus, Port Gawler.

More than one species may be present.

Baerietta sp.

Hosts and Locality. Rhodona bougainvillii, Hemiergis peronii, Port Gawler.

The cestodes from these hosts are similar and probably belong to the same species.

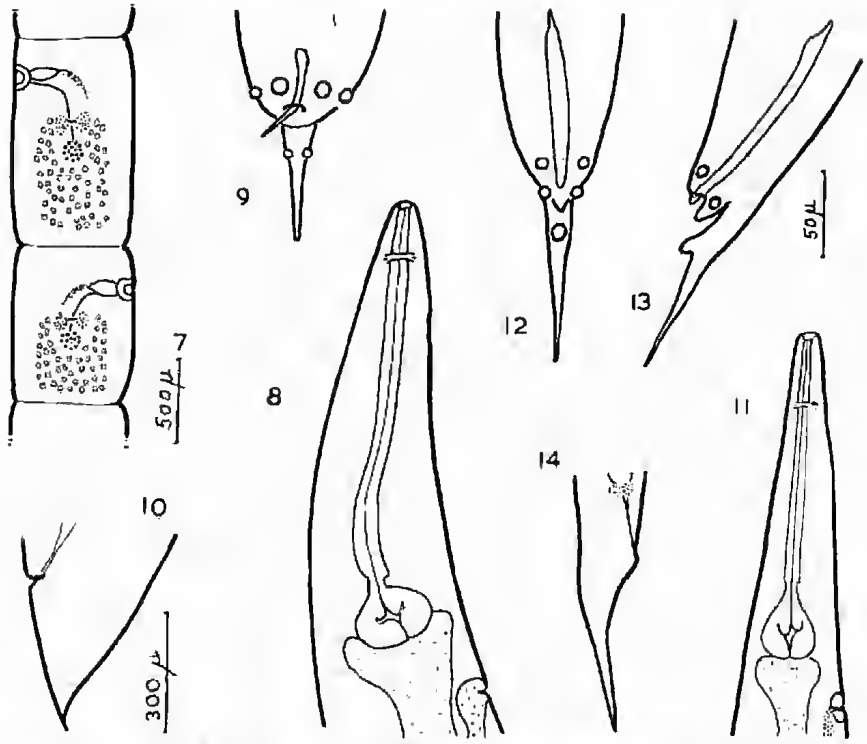


Fig. 7. *Oochoristica trachysauri*, part of strobila showing variation in shape of segments. Figs. 8-10, *Thelandros kartana*, 8, anterior end; 9, ventral view of male tail; 10, female tail. Figs. 11-14, *T. trachysauri*, 11, anterior end; 12 and 13, ventral and lateral views of male tail; 14, tail of female. Figs. 9, 12, 13, to scale beside 13, figs. 8, 10, 11 and 14 to scale beside 10.

NEMATODA

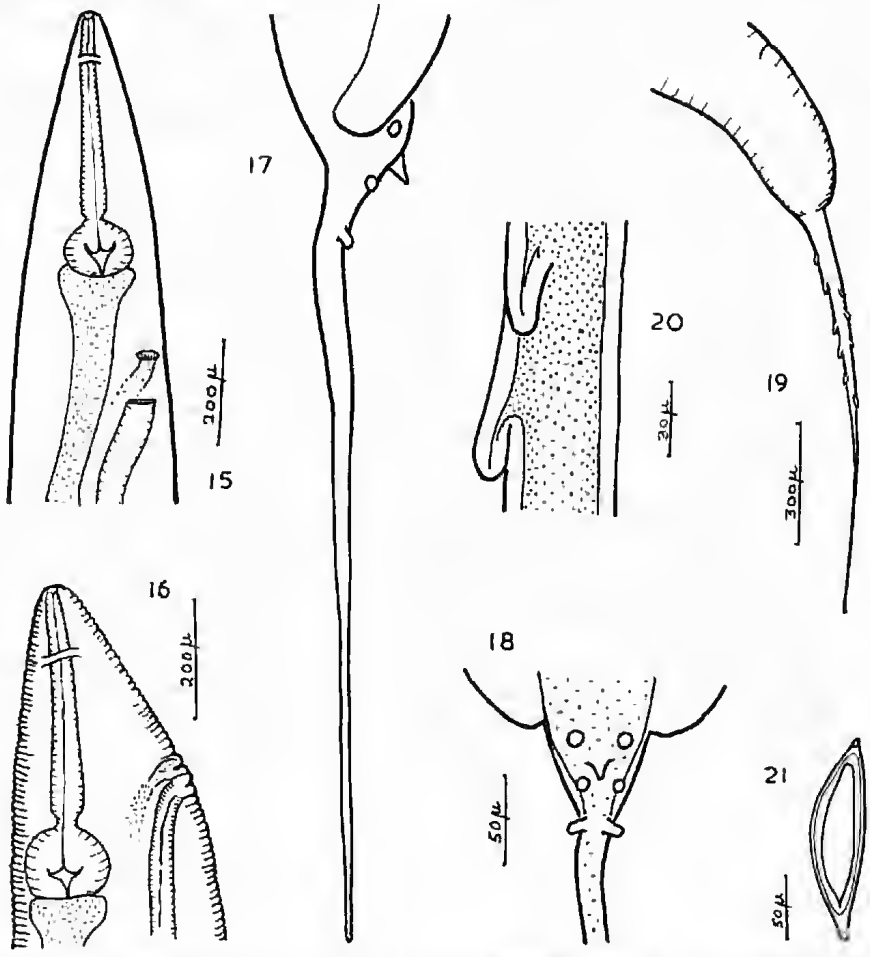
The nematodes taken from the lizards at Port Gawler show an interesting host distribution. None were found in *Ablepharus greyii* or *Rhodona bougainvillii*. Oxyurids were found in *Hemiergis peronii*, *Trachydosaurus rugosus* and *Phyllodactylus marmoratus*, and in almost all cases each of these hosts carried only its own species. The exceptions were two *P. marmoratus*, in which were *Thelandros kartana*, typically present in *H. peronii*. Although *H. bougainvillii* is apparently free of nematodes in this area, it carries the same cestode species as does *H. peronii* and these species are in turn different from that from *T. rugosus*. This difference in parasites may be due to a high degree of host specificity among the oxyurids, and perhaps of resistance among the lizards, or it may be explained in part by the different niches occupied by the lizards. Dr. Smyth has informed us that *R. bougainvillii* and *H. peronii* live mainly under certain bushes, *A. greyii* and *P. marmoratus* mainly under wood, stones, etc., and *T. rugosus* (a much larger lizard) may be found in either habitat. Most of the lizards are diurnal and insectivorous; *T. rugosus* is diurnal and predominantly vegetarian; *P. marmoratus* is nocturnal and insectivorous. Oxyurid eggs might be expected to be quite common over the surface in the area, especially those of *Thelandros trachysauri* which occurs in hundreds in each host animal.

Thelandros kartana Johnston and Mawson
(Figs. 8-10)

Thelandros kartana Johnston and Mawson, 1941, 145; from *Hemiergis peronii*, Kangaroo Island.

Hosts and Localities. Hemiergis peronii, Port Gawler, Middle Beach. *Phyllodactylus marmoratus*, Port Gawler.

Thelandros kartana was taken from 22 specimens of *H. peronii* from Middle Beach and 27 from Port Gawler. Female worms with eggs were taken from two *P. marmoratus*. No more than four worms were present in any one lizard, and usually only one or two. They occurred almost always in the short caecum at the junction of small and large intestine. The new specimens have been compared with paratypes of *T. kartana* and found to agree closely. The original description can now be augmented by Figures 8-10 and measurements in Table 3. The measurements of the specimens from *P. marmoratus* are within the range of those from *H. peronii*.



Figs. 15-21. *Skrjabinodon smythi*, 15 and 16, anterior end of specimens in relaxed and contracted states respectively; 17, posterior end of male; 18, ventral view of cloacal region, male; 19, tail of female; 20, part of spike of female tail showing 'spines'; 21, egg. Figs. 17 and 18 to same scale.

Thelandros trachysauri Johnston and Mawson

(Figs. 11-14)

Thelandros trachysauri Johnston and Mawson, 1947, 24, from *Trachydosaurus rugosus*, Adelaide.

Host and Localities. Trachydosaurus rugosus, Port Gawler, Middle Beach.

Thelandros trachysauri has been found in nearly all *T. rugosus* dissected in this Department—more than thirty-five from various places. It is present in very large numbers in the middle and posterior parts of the large intestine. The collections from the Port Gawler area agree with the original description, which can now be amplified by measurements of more specimens (Table 3) and by Figures 11-14.

The lateral alae, present in both sexes, are not very wide; in the male they extend from the posterior oesophageal region to near the cloaca; in the female they are restricted, commencing just posterior to the oesophagus and reaching to, not past, the vulva. The nerve ring is 190-210 μ from the head in females, rather more anterior than described earlier. The eggs are oval in shape, contain a bent larva, and measure 100 μ by 59-60 μ.

Skrjabinodon smythi n.sp.

(Figs. 15-21)

Type Host and Locality. Phyllodactylus marmoratus, Port Gawler. Other localities: Middle Beach, Chowilla, Loxton, Lock, all in South Australia.

Type ♂ and allotype ♀ will be deposited in the South Australian Museum.

This species appears to be common in *P. marmoratus* throughout southern Australia, although another species (unpublished) apparently takes its place in northern parts of the state. It has been taken from fourteen of seventeen host animals examined. In most cases there are about 6-8 worms in each host, but in some there are more, the greatest number being sixty-seven of which 38 were males, 7 females with eggs, and 22 females without eggs. All occur in a mass in the small caecum at the origin of the large intestine. Where few worms are present, the gravid females are stuffed with eggs, but where there are many worms, the eggs are few.

There is an apparent variation in the position of the vulva and excretory pore in the females. These appear to be oesophageal structures in some collections and well behind the oesophagus in others. This however is largely dependent on the degree of contraction of the body. It has been noted that those worms in which the excretory pore (and vulva) are oesophageal are stiff and barrel-like in appearance, with strongly marked ringed or ruched cuticle, whereas in flaccid specimens with smooth cuticle these two pores are further back. This is shown by the measurements, in Table 3, for *S. smythi* as, although the total length measurements show a great variation, the length of the oesophagus and the tail spike do not. In this Table, measurements are also given of some very flaccid specimens from Chowilla.

Lateral alae are present in both sexes, from about the midlength of the oesophageal region to the level of the anus. The amphids are large, more prominent, and slightly further back, than the four large cephalic papillae. The three lips are bilobed in the female and single in the male. At the anterior end of the oesophagus of the male are three small teeth, not present in the female. The position of the nerve ring is not clear in most specimens. The excretory pore is a transverse slit with cuticularised lips and it lies posterior to the oesophagus in relaxed specimens. It is more posterior in the male than in the female.

The male is without caudal alae; the male tail spike has a few very minute spines. There is no spicule, but cuticularised projection of the cloacal wall is

TABLE 3

Measurements of *Thelandros kartana*, *T. trachysauri* and *Skrjabinodon smythi*. All measurements are in μ unless otherwise indicated. The tail of the male *S. smythi* from Port Gawler is broken.

Species	*T. kartana*	*T. trachysauri*	*S. smythi*		
Locality	Port Gawler	Middle Beach	Port Gawler	Port Gawler	Chowilla
State of contraction			(contracted)	(relaxed)	(flaccid)
Males:					
length (mm)	1·6–3·0	1·5–2·5	1·40–1·78	2·4–2·5	1·75–2·10
oesophagus	320–480	550–650	220–300	250–275	290–300
antr. end-exer. pore	560–1000	550–900	330–370	600–650	400–490
tail spike	50–70	100–120	360–410	400–420	450–550
spicule	65–75	100–150	—	—	—
Females:					
length (mm)	2·1–6·5	3·3–3·5	3·6–4·5	5·0–7·0	5·9–8·4
oesophagus	400–1200	820–980	500–560	470–500	450–500
antr. end-exer. pore -vulva	530–1400	900–1000	300–400	550–650	550–700
	3·0–4·8	1·9–2·0	350–450	650–760	600–780
tail	100–150	390–450	1390–1500	1350–1800	1500–1600
tail spike		—	1000–1050	800–1050	900–1000

present. The preanal, adanal, and postcloacal papillae are almost evenly spaced on the ventral surface. Dorsolaterally to each adanal papilla is a papilla-like extension into, but not lifting, the cuticle, and terminating at a tiny pore. These are probably the phasmids.

The tail of the female bears about 7-9 irregularly spaced projections which are more digitiform than spinous (Fig. 20). The vulva is a transverse slit, without thickened lips. The eggs are 150-165 μ long, with a plug at each end and slightly flattened on one side. The most mature eggs contain a larva 120 μ long.

The genus *Skrjabinodon* was proposed by Inglis (1968, 179) for some species which had been placed in *Parathelandros* Baylis but which differed from the type species of this genus, and from other species which he described at that time. The species attributed to *Parathelandros* are all from Australian frogs, and those to *Skrjabinodon* are from lizards, mostly from places other than Australia, but one, S. *oedurae* (Johnston and Mawson) from an Australian lizard. The present specimens agree generally with other species of *Skrjabinodon* and with the generic diagnosis proposed by Inglis, except in the two characters which he marks as doubtful, namely the absence of onchia at the anterior end of the oesophagus (present in the male of S. *smythi*) and the lip shape, which does not appear to be bilobed in the male of S. *smythi*.

The species is differentiated from S. *anolis* (Chitwood), the only other species of the genus in which the spicule is absent and the female tail bears large "barbs", by the shape of the barbs, the larger size of the eggs, the longer oesophagus, the more anterior position of the anus in the female, and by the rather different spacing of the male caudal papillae.

Skrjabinelazia sp.

Host and Localities: *Phyllodactylus marmoratus*, Port Gawler, Middle Beach.

The material available consists of several female worms from the intestine of five geckos. No males have been found.

The worms are large, up to 18·3 mm in length, and the cuticle at each end is markedly inflated. The anterior end bears four large papillae and two amphids. There are no lips. The mouth, more or less circular, leads into a short buccal

cavity from the walls of which project a ring of tiny teeth, like an internal leaf crown. The oesophagus, 1·2 mm long, widens towards its posterior end, but is not obviously divided into muscular and glandular parts. The nerve ring is at about one third its length from the head, and the excretory pore at the same level. Cervical papillae were not seen. The posterior end narrows suddenly 300 μ behind the anus, and the body proper ends in a short spike about 110 μ long. The inflated cuticle extends behind this for about 50 μ.

The vulva lies shortly behind the nerve ring, about 490 μ from the head. The eggs are large, sub-spherical, 90 μ in diameter, and contain a coiled embryo. The egg shell is thin and apparently not rigid, as some change their shape under pressure.

These worms are very similar in appearance to those of the genera *Skrjabinelazia* Sypliakova and *Salobrella* Freitas. The species of these genera differ, as far as the female is concerned, in the absence or presence, respectively, of lips, so the present specimens are identified as *Skrjabinelazia* sp. In the absence of males, no further identification is attempted. No species of *Skrjabinelazia*, or of *Salobrella*, has so far been recorded from Australian hosts.

ACANTHOCEPHALA

Host and Locality: *Hemiergis peronii*, Port Cawler (2) and Middle Beach (3).

Five acanthocephalan cysts were taken from the mesenteries of these hosts. They have been examined by Dr. S. J. Edmonds, who has kindly given the following information.

All the cysts appear to belong to the same genus. In only one is the introvert extended enough to permit an estimate of its measurements. The ellipsoidal cyst is approximately 800 μ long by 300 μ wide. The introvert, which is cylindrical and bears numerous hooks, is about four-sevenths extended, and is estimated as 1100 μ long and 260 μ wide. The number of hooks is hard to estimate, possibly about 30 rings each of 26 hooks.

The only acanthocephalan so far recorded from Australian reptiles is *Sphaerechinorhynchus rotundocapitatus* (Johnston, 1912), from the black snake *Pseudechis porphyriacus* Shaw. The cysts from *H. peronii* do not belong to this species.

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